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US	EMBARGO	OF	GE	EQUIPMENT:	IMPACT	ON	THE	SIBERIAN	PIPELINE

Office of Soviet Analysis CENTRAL INTELLIGENCE AGENCY 3 February 1983

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US Embargo of GE Equipment: Impact on the	e Siberian Pipeline
Key Judgments	
Should US sanctions substantially reduc-	e the availability of
Western turbines for the export pipeline, Mos	scow would encounter
considerable difficulty in building the plan	ned gasline to
Western Europe before the late 1980s. Such	an expanded embargo
to prevent Western sales to Moscow of equipm	ent embodying US
technology would increase considerably the c	ost to the USSR of
continuing with the pipeline. It would also	force Moscow to
choose between earning much needed hard curr	ency and maintaining
the rapid growth of domestic gas supplies cr	itical to the
economy.	25 <b>X</b> 1
The USSR could still complete the proje	ct, however, if
Western Europe were willing to purchase the	gas. Moscow could
soften the impact of an expanded embargo by	reconfiguring orders
placed with Western suppliers and or by dive	rting additional
resources to the export pipeline project. P	ossibilities for
acquiring turbines from the West include:	
o Switching to the Rolls-Royce turbine	;
o Using a mix of Rolls turbines and an	y other Western
models that do not depend on US tech	nology and that are
either in stock or deliverable withi	n a few years.
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Provided that We	estern governments 25X1
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enforce an expanded US embargo, any Western firm would have	
difficulty in meeting present Soviet deadlines, and the Soviets	
would be vulnerable to contractual or technological troubles.	
Nevertheless, construction of the pipeline will take so long that	
25. even drawn out deliveries probably would not prevent attainment	<b>X</b> 1
of full pipeline capacity much beyond 1986-87.	
Even if all Western turbines for the export line were denied	
by US sanctions, but the West Europeans still wanted Soviet gas,	
Moscow could make adjustments in its internal pipeline building	
program to permit the delivery of some additional gas by 1985 by:	
o Reallocating the export pipeline domestically-produced	
turbines and labor and equipment intended for domestic	
lines.	
o Extending an existing domestic pipeline to the West until	
the export pipeline is ready to operate.	
But the domestic cost of these alternatives would be	
substantial. Completion dates for reaching full capacity on one,	
and possibly two, of the five domestic trunklines would have to 25	X1
pe postponed as turbines, labor, and compressor station materials	
and equipment were transferred to the export pipeline.	
The USSR's projected tight energy position through most of	
the 1980s would make Moscow extremely reluctant to risk making	
such a sacrifice. If the gamble turned sour, the Soviets almost	
certainly would have to sharply curtain oil exports to the West	
more rapidly than we expect or reduce oil deliveries to Eastern	
Europe more than Moscow now deems politicallly feasible. The	
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turbines on the export line suggests that they want to avoid tampering with domestic pipeline construction as much as possible. They especially want to avoid a situation in which they get two or three years into construction of the export line and then find that they have to divert equipment from domestic line construction at short notice, with all the disruption and potential hardship that might cause. Nonetheless, the USSR's great need for substantially increased hard currency earnings from gas could prompt it to take the risks and pay the costs of restricting the growth of domestic gas supplies, particularly if Moscow believed that it had no other way of retaining a sizable share of the West European gas market in the late 1980s and

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# US Embargo of GE Equipment: Impact on the Siberian Pipeline

#### Introduction

The USSR is urgently searching out ways of overcoming the effect of US sanctions already imposed on the gas export pipeline between Siberia and Western Europe. An expanded embargo covering delivery to the USSR of any Western equipment using US components and technology would complicate Soviet acquisition of critical components for the turbines employed in pipeline compressor stations.\* This memorandum reviews Soviet requirements for these turbines and assesses Moscow's prospects for offsetting an expanded embargo by either turning to other Western suppliers for turbines or building the export line without relying on the purchase of foreign-made turbines.

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# Soviet Turbine Requirements

The USSR plans to install more than twice as much turbine capacity on its gas pipelines during 1981-85 as in 1976-80 (see Table 1). West Siberia--primarily the huge Urengoy field--will provide pratically all of the additional Soviet gas production of 18.9 billion cubic feet/day (cf/d) during that period. The increase in Siberian output will flow to consumers through six new 56-inch (1,420 mm) trunklines, with an operating capacity of roughly 3.2 billion cf/d (or the equivalent of 500,000

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<sup>\*</sup> In this memorandum, "expanded embargo" will refer only to a complete US ban on sales of Western oil and gas equipment embodying Us technology or components—including equipment assembled but not delivered before the 30 December embargo announcement.

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barrels/day of oil). The six lines will average more than 3,000 kilometers (2,000 miles) in length, although the export line will be approximately 5,000 km long. To drive the gas compressors serving the six lines and the rapidly expanding grid of smaller trunklines, Moscow is planning to add 25,000 megawatts (MW) of turbine capacity, compared with 9,800 MW in 1976-80. The new Siberian pipelines will probably require about 15,000 MW, of which the export line would account for 3,000 MW.

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Table 1: Turbine Capacity on Soviet Gas Pipelines

Year	Aggregate Turbine Stations on Line	Five-Year Increments Capacity (MW)	Number of Compressor in Capacity (MW)
1970	130	3 400	(1971-75) 4,800
1975	286	8,200	(1976-80) 9,400
1980	494	17 600	(1981-85) 25,400
1985 <sup>a</sup>	854	43,000	

a. Soviet plan.

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Turbines for the Export Line	
The Soviet Union will use 41 compressor stations to operate	
the 5,000-kilometer gas trunkline running between Siberia and	
Western Europe at a full capacity of approximately 3.5 billion	
cubic feet/day. Prime contractors for the stations are Nuovo	
Pignone of Italy (19 stations) and the West German-French	
consortium of Mannesmann and Creusot-Loire (22 stations). To	
drive the compressors in all but one station, Moscow by December	
1981 had contracted for 120 GE MS 5002 (25-MW capacity)	
industrial turbines. 1 Nuovo Pignone will produce 57 turbines;	
AEG-Kanis of the FRG, 42 units; and John Brown of the United	
Kingdom, 21 units (see Table 2). The turbine order is valued at	
more than \$600 million.	25 <b>X</b> 1
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Forty compressor stations will each use three GE turbines; the station at the gas field will use five lower-capacity turbines.	
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## Turbines for Domestic Lines

The USSR seems to be counting on domestic production to supply a large share of the increment in total pipeline turbine capacity in 1981-85. Whereas imports from the West accounted for roughly one-third of the increase in turbine capacity in 1976-80, the planned share in this five-year plan period appears to be about 12 percent--the 3,000 MW of turbine capacity export pipeline.

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Table 2
Siberia-to-Western Europe Gas Pipeline: Western Orders for Turbines and Compressors

<u>Order</u>	Company	Country	Value (Million US\$)
General contract for 22 compressor stations	Mannesmann/Creusot- Loire	FRG/France	940
Internal components for 5 compressors	Dresser-France	France	a
Compressor casing and assembly for 5 compressors	Demag	FRG	a
5 gas turbines for head station; 42 turbines	AEG	FRG	302
42 compressors 21 centrifugal compressors	Creusot-Loire Dresser-France	France France	a a
21 gas turbines	John Brown	UK	112
General contract for 19 compressor stations	Nuovo Pignone	Italy	1,100
57 GE heavy duty "Frame 5" model compressors and industrial gas turbines (25 MW)			
Pumping station buildings	Metex Corporation	Finland	77

<sup>\*</sup> The value of this equipment is assumed to be included under the general contract.

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o We have uncovered no major Soviet turbine orders other than	
those for the export pipeline itself.	
times would require such orders to have been placed by now.	
If Moscow plans to manufacture the turbinesroughly 22,000 MW of	
capacityfor its domestic lines, the Soviet turbine industry will	
be stretched to, and perhaps beyond, its limit to supply the	
required turbine capacity. The number of turbines produced in	
the USSRthe Soviet 6-MW turbine is used on most domestic lines-	
-would probably have to double. Although we do not know current	
Soviet capacities for producing industrial turbines, we do not	
believe that the Soviets could handle this production	
assignment.	25 <b>X</b> 1
Moscow accordingly has given top priority to developing a	
16- or 25-MW model. We do not foresee substantial serial	
production until at least the mid-1980s, even though the Soviets	
have already reported production startup for a 25-MW model. As a	
consequence, the USSR will be hard pressed to meet its turbine	
needs, even if the export pipeline is powered by Western units.	
Should US sanctions reduce or eliminate the availability of	
Western turbines for that line, Moscow would encounter	
considerable difficulty in building its gasline to Western Europe	25 <b>X</b> 1
on schedule.	20/(1
Replacing GE Turbine Components from Other Western Sources	
The Possible Options	
The USSR probably has not decided how to counteract the US	25 <b>X</b> 1
embargo already imposed.	23/1
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	Without imposition of further US	
estr	ictions, the Soviets' most immediate options include:	
0	Switching to the turbine manufactured by Rolls-Royce of the	
	United Kingdom.	1
0	Using Rolls-Royce turbines on part of the pipeline and GE	
	turbines on the remainder.	
0	Purchasing whatever Western turbines are either in stock	
	or could be delivered within	
	probably two years.	25>

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Assessing	The Alternatives	
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Dalla Pay	e is probably best prepared to meet the late 1	983
	inal delivery date for turbines that Moscow	
	seeking. The firm has considerable spare	
oduction cap	city because of declining orders for aircraft	
ngines,		
it the Rolls	option nonetheless is not as easy as it might s	eem:
o Tooling	up to manufacture the pipeline version of the	
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ngines, ut the Rolls	option nonetheless is not as easy as it might s	

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turbine and modifying units on the shelf for pipeline use would take considerable time. The ability of hundreds of Rolls subcontractors to ensure timely supply of parts is uncertain.

- o For gas pipeline use, RB-211s have been matched with Cooper-Bessemer (US) power turbines and gas compressors. The acquisition of non-US replacements for this equipment could cause additional delay.
- o A complete Soviet switch to Rolls-Royce would almost certainly create contractual problems with West European companies now holding subcontracts for turbine and compressor components. New supplier contracts for the Rolls turbine would have to be negotiated.
- o The loss of pipeline-related jobs in West Germany, France, and Italy is a major reason for current West European uneasiness over the existing US embargo. Nonetheless, the attractive price of Soviet gas and the retention of major pipeline-related pipe and equipment orders in those three countries--the principal gas importers under the deal--would probably sustain high West European interest in seeing the pipeline completed.

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## Impact of an Expanded Embargo

Assuming that Western governments enforced a US ban on Soviet imports of any Western gas equipment using US technology or components, Moscow's options for acquiring turbines abroad would substantially diminish. The Soviets could still:

- o Rely entirely on Rolls-Royce, with the attendant technological and contractual problems;
- o Import an assortment of less powerful turbines that use neither US parts nor technology and that—by themselves or together with Rolls-Royce units—would enable Moscow to equipment or all of the export pipeline by mid-decade. In either case, turbine deliveries would probably be delayed a

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	25 <b>X</b> 1
year or more beyond the current Soviet schedule.	25 <b>X</b> 1
Nonetheless, drawn-out deliveries of either Rolls-Royce or	
other turbines would probably not delay attainment of full	
capacity on the Siberia-to-Western Europe pipeline much beyond	
the date likely in the absence of any US sanctions. The	
difficult terrain and weather along the 5,000 km. pipeline route	
will probably prevent completion of the line, compressor	
stations, and auxiliary installations until late-1986 or early	
1987, even if all turbine-compressor units are delivered by late	
1983 or early 1984. Soviet construction of compressor station	
buildings is particularly slow even with West European	
assistance. Many turbines would sit for months awaiting	
installation. Because many compressor station housings will	
probably not be finished until 1986, late-arriving turbines would	
not create a major bottleneck.	25 <b>X</b> 1
Relying on Domestic Production	
Even if expanded US sanctions severely reduced the number of	
foreign-made turbines available to the USSR, gas deliveries to	
Western Europe could probably begin by late-1984 or early 1985 at	
up to one-third of planned capacity. Moscow has several	
options. It could:	
o Transfer turbines and compressors to the export pipeline	
from existing lines in which lower operating pressures are	
acceptable, or remove spare turbines at the risk of	
reducing pipeline reliability.	

Reallocate to the export pipeline material, labor, and

domestically produced turbines intended for building

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compressor stations on domestic lines.

- o Increase the rate of conversion of retired aircraft turbine engines to pipeline service. Enough large aircraft engines are being retired annually to substitute entirely for Western turbines on the export pipeline (in terms of gas-generator capacity), although a major expansion in conversion of aircraft turbines to mechanical drive would be difficult.
- O Extend an existing trunkline in the European USSR to the Czech border for West European linkup by 1984-85 while continuing to build the export pipeline. Several lines from West Siberia will be operating by then, giving Moscow flexibility in minimizing the interruption in domestic pipeline construction and softening the impact of increased exports on domestic consumers.

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The domestic cost would be substantial. Completion dates for reaching full capacity on one, and possibly two, of the five domestic trunklines would have to be postponed as turbines, labor, and compressor station materials and equipment were transferred to the export pipeline. If, as we believe, the Soviets do not produce nearly as much turbine capacity as they apparently are planning, an all-out effort on the export line might delay for one or more years gas deliveries of up to 3.2 billion cf/d (or the equivalent of 500,000 b/d of oil).

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The USSR's projected tight energy position through most of the 1980s would make Moscow extremely reluctant to risk making such a sacrifice. The Soviets almost certainly would have to

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sharply curtail oil exports to the West or be forced to reduce oil deliveries to Eastern Europe more rapidly during 1981-85 than Moscow now deems politically feasible. The Soviets' apparent willingness to use a mixture of foreign turbines on the export line suggests that they want to avoid tampering with domestic pipeline construction as much as possible. They especially want to avoid a situation in which they get two to three years into construction of the export line and then find that they have to divert equipment from domestic line construction at short notice with all the disruption and potential hardship that that might cause. Nonetheless, the importance of substantially increased hard currency earnings from gas could prompt the Soviets to restrict the growth of domestic gas supplies, particularly if Moscow believed that it had no other way of retaining a sizable share of the West European gas market in the late 1980s and 1990s.